

Research Need Committee Report

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Research Priorities Committee Charges

1. Identify and evaluate research needed in the Southern Region to accomplish soil surveys
 - a. Class criteria for gypsum content in soil interpretations
 - i. at what gypsum percentage does piping occur within the soil,
 - ii. at what gypsum percentage does cavern formation occur in soils,
 - b. The “new soil survey” needs sampling requirements for dynamic soil properties. Identify existing data sets in the Southern Region that can be used to determine the spatial variability of near surface dynamic soil properties.
 - c. Identify and/or suggest methods to predict highly variable soil properties such as infiltration from less costly measures
2. Review status of 5-year Soil water table study
3. Identify known elements of ground water Spodosols formation and develop model to predict their occurrence in landscapes
4. Evaluate and identify ways to integrate soil spectroscopy tool into soil survey activities

These topics were discussed. The following are items discussed, and recommendation from those attending the breakout.

Identify and evaluate research needed in the Southern Region to accomplish soil surveys

1. Gypseous soils
 - a. Develop and test standards for:
 1. physical properties
 2. chemical properties
 3. morphology
 4. terms and horizon designations
 - b. Taxonomy – be sure we have soils and data before taxonomic classes are proposed
2. The “new soil survey” needs sampling requirements for dynamic soil properties. Identify existing data sets in the Southern Region that can be used to determine the spatial variability of near surface dynamic soil properties.
 - a. Obtain dynamic soil properties at the same time when a soil is sampled for characterization
 - b. Total C, N and P data should be obtained for all horizons

c. The new soil survey needs sampling requirements for dynamic soil properties. Identify existing data sets in the Southern Region that can be used to determine the spatial variability of near surface dynamic soil properties.

We need to be able to make recommendations to the field of how many samples to collect. ARS, NRCS and NPS have developed a multi-scale soil sampling requirements estimator to do so, but need variance information to feed it. Please check with researchers to identify any journal articles or theses or other data sets that include information about soil property variability. Spatial variability studies from the 1990's probably exist, but we don't know where to find them.

d. What sampling requirements should be implemented?

Management systems within a particular land use will be sampled and compared to make statements about how soils have changed and about differences that are functionally important. The number of samples collected should be sufficient to detect a functionally important difference in dynamic soil properties at the desired level of precision and acceptable error rates. Then this information can be used to make soil interpretations.

e. What are some of the near surface dynamic properties that could be researched?

Eight functionally important dynamic soil properties have been identified for inclusion in a minimum data set for all types of soils. These will be included in soil survey update projects on dynamic soil properties and include:

Organic C (Total C - CaCO_3 -C)

pH

EC

Bulk density/soil porosity

Soil structure (grade, size, type) and macropores (kind for connectivity)

Aggregate stability (wet)(If aggregates are likely to be disrupted during sampling or shipping, omit this property.)

Total N

Soil stability kit (field)

Research needs related to these properties include the following:

- a) Simple, quantitative (and preferably field) methods are needed for soil structure, porosity and pore connectivity, soil aggregate stability.
- b) Information to predict the seasonal variation in near surface dynamic soil properties such as pH, EC, structure, aggregate stability.
- c) Information about the magnitude of difference in these properties that is functionally important for various management systems.

Some functionally important properties were not included in the initial data set because the variability and cost of getting enough data is so high. Therefore, research is needed to develop procedures, such as pedotransfer functions or simulation models, which can be used to estimate more costly methods such as infiltration, K-sat. Then the properties needed in a pedotransfer function or model could be included in the minimum dataset.

d. Do you think NRCS is willing to pay for such?

NRCS certainly supports the need for this research, but has very limited funds to put towards any research. I'd like to suggest that the National Cooperative Soil Survey take proactive steps to encourage greater funding levels for research. The NCSS could develop a Research Agenda to define research priorities for the future. Granting agencies such as NSF and CSREES should be the target audience for such a paper. It could even be published as other disciplines have done. These agencies want to hear from their constituents. We just need to present them with clearly articulated priorities that are scientifically substantiated and that can be shown to benefit society. Given climate and environmental change, research on soil change should be easy to justify.

3. Identify known elements of ground water Spodosols formation and develop model to predict their occurrence in landscapes

a. Form a task force with specific charges in order to develop a model or research the water table Spodic horizon relationships – this may lead to specific research projects such as water table /Spodic horizon identification and monitoring

4. Evaluate and identify ways to integrate soil spectroscopy tool into soil survey activities

a. Past and current research has/is addressing this charge

b. Christine Morgan, TAMU, is actively working on this. Texas NRCS has provided some funding for this and I have MS student working on soil mapping strategies using VisNIR Spectroscopy. I have a colleague that has put VisNIR on a soil probe (David brown WSU) and is mapping soils but it is all so new I doubt it has been published.

c. Publications

Waiser, T.H., 2006. *In situ* characterization of soil organic and inorganic carbon with visible near-infrared diffuse reflectance spectroscopy. MS Thesis. College Station, TX. Texas A&M University, Department of Soil and Crop Sciences.

Wasier, T., C.L.S. Morgan, D.J. Brown, and C.T. Hallmark. 2007. In Situ Characterization of Soil Clay Content with Visible Near-Infrared Diffuse Reflectance Spectroscopy. *Soil Science Society of America Journal*. 71:389-396.

Ge, Y., C.L.S. Morgan, J.A. Thomasson, and T. Waiser. 2007. A New Perspective to Near Infrared Reflectance Spectroscopy: A Wavelet Approach. *Transactions of ASABE*. 50(1):303 - 311.

Ge, Y., J.A. Thomasson, C.L.S. Morgan, and S.W. Searcy. 2007. VNIR diffuse reflectance spectroscopy for agricultural soil property determination based on regression-kriging. Transactions of ASABE. 50(3):1081-1092.

5. Plinthite

- a. States in which plinthite occur should cooperate to:
 1. understand the processes associated with: i. landforms, ii. root restriction (chemical and/or physical), and iii. water movement relationships (Ksat)
- b. re-evaluate the slaking procedure and cementation criteria (do you create an abnormal condition when you dry the sample)
- c. review past literature and evaluate current data in order to develop classes and criteria (do not follow WRB just to be the same)

6. Anthropogenic soils (reclaimed mine soils both lignite and phosphatic soils)

- a. Reclaimed lignite soils, descriptions and classification have been addressed and publications are available
- b. Phosphatic soils have not been addressed and some consideration of their characteristics and classification should be addressed

7. PI's should contact the Soil Survey Lab (Larry West) and request that the lab become a cooperator of their project, such that the lab could provide analyses for the proposed project. This cooperation is viewed as a positive by CRESSE and NSF as it can substantially reduce cost. PI's can use this cost as matching funds.